

In accordance with the present invention, this problem can be averted by allocating a great part of the burden of the zooming action to the third lens group, whereby a satisfactory zoom ratio and compactness are achieved with no considerable change in the power ratio between the first and second lens groups. To allow the third lens group to have a great zooming action, it is then required that the third lens group have relatively large power, as defined by condition (1). When the lower limit of 0.5 in condition (1) is not reached or when the power of the third lens group becomes weak with respect to the power of the second lens group, the amount of movement of the third lens group during zooming becomes too large. With this, the amount of movement of the second lens group to keep the image plane at a constant position becomes large, failing to achieve compactness. When the upper limit of 1.2 is exceeded or when the power of the third lens group with respect to the second lens group becomes too strong, the amount of astigmatism produced at the third lens group becomes too large, and the distance between the third lens group and an object point therefor becomes too short. This in turn makes it impossible to provide a sufficient space between the second and third lens groups. For the insertion of an image pickup element package such as a CCD or CMOS, an IR cut filter, a low-pass filter or the like in the optical system, it is required that a back focus f_B be at least 2.5 mm. At a back focus f_B of greater than 4.5 mm, on the other hand, compactness is unachievable. For this reason, it is required to satisfy the following condition (10):

$$2.5 \text{ mm} < f_B(\text{min}) < 4.8 \text{ mm} \dots (10)$$

Here f_B (min) is a value obtained when the length, as calculated on an air

B1
conced

basis, from the final surface of the powered lens in the zoom lens system to the image plane is minimized in the overall zooming zone. Intended by the term "powered lens" used herein is a lens whose refracting power is not zero.

[Page 28, delete the whole paragraph starting in line 16 and replace it with the following new paragraph.]

Figures 1a and 1b are sectional schematic views illustrative of Example 1 of the zoom lens according to the invention.

[Page 28, delete the whole paragraph starting in line 18 and replace it with the following new paragraph.]

Figures 2a and 2b are sectional schematic views illustrative of Example 2 of the zoom lens according to the invention.

B2 [Page 28, delete the whole paragraph starting in line 20 and replace it with the following new paragraph.]

Figures 3a and 3b are sectional schematic views illustrative of Example 3 of the zoom lens according to the invention.

[Page 28, delete the whole paragraph starting in line 22 and replace it with the following new paragraph.]

Figures 4a and 4b are sectional schematic views illustrative of Example 4 of the zoom lens according to the invention.

B2
Conc'd

[Page 28, delete the whole paragraph starting in line 24 and replace it with the following new paragraph.]

Figures 5a and 5b are sectional schematic views illustrative of Example 5 of the zoom lens according to the invention.

[Page 28, delete the whole paragraph starting in line 26 and replace it with the following new paragraph.]

Figures 6a and 6b are sectional views illustrative of Example 6 of the zoom lens according to the invention.

[Page 31, delete the whole paragraph starting in line 9 and replace it with the following new paragraph.]

Figures 28a -28d are aberration diagrams of Example 1 at a wide-angle end thereof.

[Page 31, delete the whole paragraph starting in line 11 and replace it with the following new paragraph.]

B3
cont

Figures 29a-29d are aberration diagrams of Example 1 at an intermediate focal length.

[Page 31, delete the whole paragraph starting in line 13 and replace it with the following new paragraph.]

Figures 30a-30d are aberration diagrams of Example 1 at a telephoto end thereof.

[Page 31, delete the whole paragraph starting in line 15 and replace it with the following new paragraph.]

Figures 31a-31e are aberration diagrams of Example 17 at a wide-angle end thereof.

B3
could.

[Page 31, delete the whole paragraph starting in line 17 and replace it with the following new paragraph.]

Figures 32a-32e are aberration diagrams of Example 17 at a telephoto end thereof.

[Page 32, delete the whole paragraph starting in line 18 and replace it with the following new paragraph.]

Figs. 1a and 1b are schematic views illustrative of one sectional arrangement of Example 1. Example 1 is made up of, in order from an object side thereof, a first positive lens group G1, a second negative lens group G2, a stop S, a third positive lens group G3, and a fourth positive lens group G4. The first lens group G1 remains fixed during the zooming, the second lens group G2 moves from the object side to an image plane side of the system during zooming from a wide-angle end thereof to a telephoto end thereof, the third lens group G3 moves from the image plane side to the object side during zooming from the wide-angle end to the telephoto end, and the fourth lens group G4 moves to keep an image plane at a constant position during zooming.

B4

[Page 33, delete the whole paragraph starting in line 18 and replace it with the following new paragraph.]

B5
Figs. 2a and 2b are schematic views illustrative of one lens arrangement of Example 2. The overall power profile and zooming movements in Example 2 are the same as in Example 1.

Page 34, delete the whole paragraph starting in line 12 and replace it with the following new paragraph.

B6
Figs. 3a and 3b are schematic views illustrative of one lens arrangement of Example 3. The overall power profile and zooming movements in Example 3 are the same as in Example 1.

[Page 35, delete the whole paragraph starting in line 3 and replace it with the following new paragraph.]

B7
Figs. 4a and 4b are schematic views illustrative of one lens arrangement of Example 4. The overall power profile and zooming movements in Example 4 are the same as in Example 1.

[Page 35, delete the whole paragraph starting in line 22 and replace it with the following new paragraph.]

Figs. 5a and 5b are schematic views illustrative of one lens arrangement of Example 5. The overall power profile and zooming movements in Example 5 are the same as in Example 1.

Page 36, delete the whole paragraph starting in line 14 and replace it with the following new paragraph.

B8
Figs. 6a and 6b are schematic views illustrative of one lens arrangement of Example 6. The overall power profile and zooming movements in Example 6 are the same as in Example 1.

Page 105, delete the whole paragraph starting in line 1 and replace it with the following new paragraph.

B9
Aberration curve diagrams for Example 1 are shown in Figs. 28a-28d, 29a-29d and 30a-30d wherein Figs. 28a-28d show aberrations at the wide-angle end thereof, Figs. 29a-29d show aberrations at an intermediate focal length thereof, and Figs. 30a-30d show aberrations at the telephoto end thereof. Aberration diagrams for Example 17 of the zoom lens system according to the invention when focused on an object at infinity are attached hereto as Figs. 31a-31e (at the wide-angle end) and Figs. 32a-32e (at the telephoto end) wherein Figs. 31a and 32a show spherical aberration, Figs. 31b and 32b show astigmatism, Figs. 31c and 32c show distortion, Figs. 31d and 32d show chromatic aberration of magnification, and Figs. 31e and 32e show coma, with ω standing for a half field angle.

See the attached Appendix for the changes made to effect the above paragraphs.